

Comments on the Chesapeake Bay TMDLs
Docket Number EPA-R03-OW-2010-0736
City of Virginia Beach, Virginia

The City of Virginia Beach, Virginia adopts and incorporates the comments submitted by the Hampton Roads Planning District Commission (HRPDC) and the Virginia Municipal Stormwater Association (VAMSA), and in addition submits comments on the proposed Chesapeake Bay TMDLs as follows:

EXECUTIVE SUMMARY OF COMMENTS

The City of Virginia Beach understands the treasure that the Chesapeake Bay is to the area. Its citizens and visitors use the Bay for recreation, for fishing, both recreational and commercial, for boating and for the sheer beauty that its waters bring. The City understands and agrees that the Bay needs care and cleansing. The City is very cognizant of the worth of the Chesapeake Bay and is very willing to do its part to restore the health of the Bay. However, the methodology and modeling used in the TMDL process are so seriously flawed as to cast doubt upon its effectiveness in accomplishing this goal.

The EPA has failed to provide the City, as well as the public, with sufficient data and documentation to properly review, evaluate, and fully comment on the proposed allocations. The information and data that is available show that the model and model inputs are lacking in the level of precision that should be required of regulatory action with consequences as significant and widespread as the Bay TMDL.

The Phase 5.3 model used to derive the proposed allocations is new, untested, and flawed. In establishing the TMDL by an artificially-imposed deadline, EPA has proposed draft allocations without first calibrating the model and verifying the accuracy of the model predictions. In fact, EPA has effectively acknowledged that the model and model inputs are incomplete by announcing its intention to conduct additional model calibration after the TMDL is established.

The flaws in EPA's proposed allocations are compounded in the James River basin by its use of model results that are poorly calibrated against the basin's chlorophyll-a standards. A knee-of-the-curve analysis shows that EPA's use of poorly-calibrated model results and a one-percent non-attainment rate for the chlorophyll a standards will have enormous adverse economic consequences for all of the Hampton Roads localities with no quantifiable water quality benefit.

EPA's proposed backstop allocations for the James River basin provide some relief for urban runoff sector, but not nearly enough to provide reasonable assurance that the allocations can be achieved. The average 54 percent load reduction needed to achieve the backstop allocation for phosphorus would require treatment of approximately 65 percent of the impervious land area in the Hampton Roads Localities at a total estimated cost of \$9.5 billion, not including the cost of land acquisition, between now and 2025. As most of the land that will need to be

acquired is already developed, the cost of acquiring sufficient land will be massive. The consequences of these expenditures will, of course, be exacerbated in the current economic climate, in which localities are already severely stressed financially.

Although the proposed backstop allocations reflect the difficulty of achieving significant load reductions from the agriculture and onsite septic sectors, they fall far short of reflecting the difficulty of achieving such reductions from the urban runoff sector. EPA appears to simply assume that the reductions can be achieved because MS4s are subject to federal and state permitting authority under the NPDES, but this assumption fails to recognize that the Localities own, on average, only about 20 percent of the land area within their respective jurisdictions. Therefore, most of the retrofits needed to achieve the load reductions will have to be implemented on private lands over which the Localities have no control in the absence of new development or redevelopment requiring local land use approvals. As previously noted, the costs of land acquisition alone will be enormous.

I. INFORMATION REGARDING CITY OF VIRGINIA BEACH, VIRGINIA

A. The City of Virginia Beach is both an urban and rural municipality located at the mouth of the Chesapeake Bay. The City of Virginia Beach consists of approximately 248 square miles, with a population of approximately 433,500. Only the urban northern portion of the City is located in the Chesapeake Bay watershed. Significant portions of the City, including its rural southern portion, are not located in the Watershed, as portions of the City drain southerly and to the Atlantic Ocean.

B. City MS4 Program—The City is considered a large MS4 locality and its stormwater is regulated by the MS4 permit issued to the City. That permit is now approximately nine (9) years old, and was originally issued in March 2001.

C. Factors Affecting Stormwater Control in City—The City of Virginia Beach is in a unique and untenable situation regarding its ability to meet any required allocations. There is very little agriculture in the City's Chesapeake Bay Watershed. The City does not operate any wastewater treatment plants (Hampton Roads Sanitation District) and, as a result of a comprehensive program of extending public sewer facilities to properties in the Chesapeake Bay Watershed, there are very few private septic systems left in the Chesapeake Bay Watershed. As a result, the City is forced to realize all of its reductions in the urban stormwater arena, where any reductions are the most costly and the least efficient. Stormwater management in the City is also hampered by the difficulty of infiltration in some areas where extensive clay soils prevent or retard infiltration, and by the very high groundwater table, which is a problem almost everywhere in the City's Chesapeake Bay Watershed. The topography of the City is very flat and there is an extensive tidal influence, thus making retrofits a costly option. If the EPA backstops remain, the City could retrofit **all** of its property, **and still not meet the required allocation**. Further, the use of multiple treatment options to meet the EPA's desired efficiencies will increase the amount of land required for retrofitting in the portion of the City that is already fully developed. As a result, the City will be forced to acquire private property interests to allow it to retrofit to a level that would meet the EPA's allocation.

D. The Socio-Economic Impact of the Proposed Urban Runoff Allocations-It is impossible to predict the full extent of the socio-economic consequences of attempting to undertake an effort of this magnitude, because such an undertaking has never been tried before. However, it is clear that there is no assurance that the load reductions that would be required to achieve the backstop allocations can be accomplished by EPA's 2025 deadline, and that the cost would be totally out of proportion to any water quality benefit.

As the Hampton Roads area, like the nation as a whole, is in the grip of the worst economic times since the Great Depression, this is the worst possible time for the requirement of retrofitting, given the massive outlays of money it would require from the private and the public sector. As localities face previously unheard-of financial crises, and businesses, especially small and family-owned ones, struggle to remain afloat, the consequences of complying with the proposed EPA mandates will be devastating. And given the uncertainty of success in restoring the Bay by means of retrofitting urban areas, the proposed EPA action is unreasonable.

Further, the EPA has failed to consider an important aspect of the problem, the cost to the locality to implement the TMDLs. Given that cost is one of the main limitations on fully accomplishing the Bay restoration, EPA's failure to consider cost-effectiveness or cost-benefit is arbitrary and capricious.

II. EPA HAS FAILED TO PROVIDE THE CITY OF VIRGINIA BEACH, VIRGINIA WITH SUFFICIENT TIME TO REVIEW, EVALUATE, AND COMMENT ON THE DRAFT TMDLs

Despite the enormous size and complexity of the TMDL documents released on September 24, 2010 the grave socio-economic consequences of the proposed allocations, and the arbitrary nature of EPA's decision to establish the TMDLs by Dec 31, 2010, when it could have given the public additional time to comment had it simply observed the May 2011 deadline in the consent decree, the City has not have sufficient time to adequately review and respond to the TMDLs in detail. Forty five days is certainly not adequate to assemble all of the information necessary to respond to the TMDLs. Further, the City will defend vigorously any claim of waiver due to failure to submit comments on the TMDLs on the basis that insufficient time was given to adequately respond.

III. OVERVIEW OF MODELS AND MODELING USED TO DERIVE THE PROPOSED URBAN RUNOFF ALLOCATIONS

The Phase 5.3 Chesapeake Bay Watershed Model computer model (CBWM) is enormous, and has been described as one of the world's largest environmental models. The 64,000 square-mile watershed spans roughly one-quarter of the East coast of the United States. However, CBWM is only a component in the larger Chesapeake Bay Program suite of models.

Four major modeling components are used to develop the input data for CBWM. A substantial amount of nitrogen is deposited from the atmosphere into the Bay, and land use

changes have significant implications for nutrient and sediment loading. All of this data is pre-processed in antecedent models, and then aggregated in a tool called the “Scenario Builder.”

IV. EPA HAS FAILED TO PROVIDE THE CITY OF VIRGINIA BEACH, VIRGINIA WITH ACCESS TO INFORMATION NEEDED TO FULLY EVALUATE AND COMMENT ON THE PROPOSED URBAN RUNOFF ALLOCATIONS

A. CBWM Input Mapping Data

To date EPA has not been able to document the tremendous amount of input data required for the TMDL modeling effort. The Virginia Department of Conservation and Recreation requested mapping from the Chesapeake Bay Program Office (CBPO) that would indicate locations of various urban land use categories (such as Impervious High Intensity, Impervious Low Intensity, Pervious High Intensity, and Pervious Low Intensity) used in the Phase 5.3 TMDL modeling. CBPO indicated that significant effort would be required to produce such mapping. Likewise, there is very little documentation that would allow modelers outside EPA to ascertain how the data was collected and synthesized, which makes working with CBWM a highly unreliable proposition at the state and local levels. More thorough disclosure of documentation is sorely needed, not merely on the model, but just as importantly on the data. The City will defend vigorously any claim of waiver due to failure to submit comments to the TMDLs on the basis that EPA withheld pertinent information to evaluate the program.

B. Scenario Builder

The Scenario Builder was supposed to be available to the modeling community as part of the Chesapeake Bay Modeling Program, but has not yet been released outside EPA. Absent the Scenario Builder, modelers must rely on EPA to process the input data to CBWM, and cannot improve the model with local data. In fact, all of the ‘modeling’ that has been done by the State of Virginia to date is in essence ‘post-processing’ of EPA modeling results rather than independent modeling.

V. FLAWS IN THE MODEL USED TO DERIVE THE PROPOSED ALLOCATIONS

A. The Phase 5.3 CBWM has not been calibrated

EPA claims that the Phase 5.3 CBWM model has been calibrated. Yet 920 square miles of urbanized land have been erroneously entered as ‘forest’ in the model. A recalibration effort is expected to begin in October 2010, but will be too late to be adequately addressed by the 31 December 2010 mandated deadline for final publication of the Chesapeake Bay TMDL. EPA has promoted an “adaptive management approach” in developing this TMDL, thereby creating many moving goalpost situations. There are inherent problems with any calibration effort, and CBWM is no exception. There are many ways to tweak input variables in a complicated model to make the output approximate a series of observed data—a phenomenon known as ‘equifinality’—and CBWM has a massive amount of input variables.

One indication of calibration problems is with sediment loading computations. CBWM cannot adequately match observed data for sediment loading, which held up the release of working sediment limits to the states until a month before their Watershed Implementation Plans (WIPs) were due. To accommodate the schedule, EPA adopted a “pucker factor” approach—to sidestep this problem with the model. If the Phase 5.3 model was adequately calibrated, sediment computations could be handled in a straightforward manner.

Many of the TMDL limits are targeted to pollutant reduction levels that are considerably less than the margin of uncertainty in the modeling process itself. Dr. Kathy Boomer of the Smithsonian Institute has conducted specific research and concluded that the margin of uncertainty in the TMDL models was much greater than the reductions being sought in pollutant loading. Dr. Ken Reckhow of Duke University (who chaired the Chesapeake Bay TMDL Review Committee for the National Academy) has repeatedly cautioned regulators against reporting modeling results without stipulating the uncertainty. Dr. Reckhow notes that TMDL prediction uncertainty is high, and Chesapeake Bay modelers have had issues with political decision makers being able to understand uncertainty. However, Section 5 of the Draft TMDL states:

“Models have some inherent uncertainty. Because of the amount of data and resources taken to develop, calibrate, and verify the accuracy of the Bay models, the uncertainty of the suite of models is minimized.”

Quite the opposite is true—the amount of data and complexity of the system work to increase the uncertainty, particularly when the source and content of the data have not been disclosed. Such a statement cannot be substantiated, and certainly not with vague assurances that the model is based on “good” or “strong” science.

It is important to note that the mathematical equation for a TMDL is:

TMDL = Sum of Wasteload Allocations + Sum of Load Allocations + Margin of Safety

and the margin of safety is supposed to account for uncertainty in ensuring that the TMDL is effective, but there are errors and uncertainties *in the computation of the load allocations themselves*.

There are very few (perhaps only three or four) knowledgeable technical persons with meaningful CBWM modeling experience in Virginia. For a model that will be used as the basis for billions of dollars in regulatory mandates, the technical community is lacking the checking and validation that comes from widespread use. There is no significant bug reporting and code fixing occurring, and what little modeling is being performed is being done with data that has been distributed from EPA without enough documentation to check its validity. Other computer models, such as the EPA’s own Storm Water Management Model (SWMM), have many years of active, widespread use, and debugging and code fixes occur continuously. The user community helps drive improvements that make SWMM a very well understood and reliable model. Conversely, CBWM is essentially an untested and unapplied model in 2010. The development of CBWM is undoubtedly an ambitious and worthwhile undertaking, but reasonable time has to

be given to grow and mature CBWM to the point that it can be reliably used to justify billions of dollars of expense.

B. The Phase 5.3 CBWM does not produce reliable modeling results

EPA distributes the CBWM computer program in un-compiled form, meaning that in order to run the model users must obtain a FORTRAN compiler and generate the executable computer programs from the source code. However there is a known and still unresolved problem with CBWM producing different results when compiled on different computers. Identical input data was run on different computers in August 2010 for the James, York, and Rappahannock Rivers, and CBWM produced significantly different results—with variations as high as 36% in the answers. The reliability of CBWM cannot be corroborated until repeatable results can be produced. EPA is working on this problem, but its self-imposed TMDL schedule demands do not allow the time required to produce reliable and scientifically verifiable models and modeling results.

C. EPA is using the CBWM on a scale that is beyond its predictive capability

Due to the 64,000 square-mile extent of CBWM, there is an inherent problem of scale when addressing BMPs. CBWM is better suited for overarching computations on larger scales, such as evaluating the effects of fertilizer applications on large segments of the Bay watershed, than it is in evaluating the effects of a particular BMP or group of BMPs on specific sites. EPA staff has acknowledged that the effects of individual, site-specific BMPs cannot be directly addressed in CBWM. Because the model is constructed on such a large scale, numerical effects of BMPs are lumped or aggregated in the modeling input data. This scale problem makes it very difficult for local governments to evaluate the feasibility of costly BMPs such as filtration devices and detention and retention basins that will have to be constructed to achieve water quality improvements. A single retention basin can easily cost millions of dollars, yet its effects cannot be directly isolated and evaluated in CBWM.

D. Existing imperviousness is underestimated in the CBWM

The Phase 5.3 CBWM model was prepared based on satellite photography. Early indications from four Virginia municipalities are that the use of satellite imagery has produced estimates of watershed imperviousness that are approximately 20 percent too low, which has significant implications for the amount of pollution that runs off each watershed. Localities have better imperviousness data in their Geographic Information Systems, but the TMDL development schedule did not allow time for EPA modelers to coordinate and collect this information from the localities. The implication is that if existing watershed imperviousness is underrepresented in CBWM, then so will be the existing pollution from urbanized areas. This inaccuracy could easily result in computed TMDL limits that are unattainable because in order to satisfy their “pollution diet,” municipalities will have to reduce pollution based on modeling data that assumes they are substantially (20 percent) less impervious than they actually are. In other words, if their pollution diet starts by assuming that they have 20 percent less pollution-producing impervious cover than they actually have, then in order to meet their TMDL limits they would have to reduce *all* pollution from that 20 percent *plus* the reductions mandated by the

TMDL—which are themselves very difficult to achieve. Refusal to accept more accurate data as the price of meeting an unrealistic deadline sets the City for failure.

E. There is no groundwater component in the CBWM

The absence of a groundwater component to the model is significant because groundwater transport of nutrients is a major source of pollution in the Bay. Ironically, many of the Best Management Practices (BMPs) that will be used to satisfy the TMDLs are based on removal of pollutants by infiltration, which is not addressed in the modeling. This lack of a groundwater component in CBWM means that pollutants that are routed into infiltration BMPs magically disappear from the computational universe—when in reality they are deposited into groundwater that eventually flows into the Bay.

VI. THE FLAWS AND UNCERTAINTY IN EPA’S MODELED PREDICTIONS DO NOT JUSTIFY JAMES RIVER ALLOCATIONS MORE STRINGENT THAN THOSE ESTABLISHED IN THE 2005 TRIBUTARY STRATEGY

- A. In the absence of an accurately calibrated CBWM, verifiable model inputs, and predictions within an acceptable range of uncertainty, EPA should establish the allocations for the James River watershed in the TMDLs based upon the James River Tributary Strategy.
- B. EPA’s decision to base the James River allocations on attainment of the numeric chlorophyll-a standards rather than attainment of the Bay-wide numeric dissolved oxygen standards is flawed.
 - 1. An analysis of the data shows that the Water Quality Model is poorly calibrated against the chlorophyll-a standard. Consequently, the model results used to derive the James River allocations do not accurately predict the load reductions needed to attain compliance with the James River chlorophyll-a standards.
 - 2. EPA compounded the consequences of using a poorly calibrated model when it used a one percent chlorophyll-a standard attainment rate to derive the James River allocations.
 - 3. The model results show that attainment rates between 96 and 99 percent result in changes to in-stream chlorophyll-a concentrations of between 1 and 2 ug/l, which is well within the 1-4 ug/l margin of error in the EPA-approved chlorophyll-a test method.
 - 4. The one percent attainment rate used in this case is inconsistent with attainment rates used or approved by EPA in other TMDLs.

5. EPA has failed to offer any justification for its use of a one percent attainment rate in this case, particularly in light its use of a poorly calibrated model.
6. EPA has a certain amount of discretion in determining when models are sufficiently calibrated and in establishing attainment rates. However, EPA abused its discretion when it used a poorly calibrated model and an attainment rate to establish allocations designed to achieve changes in in-stream chlorophyll-a concentrations that have significant economic consequences and no quantifiable water quality benefit.
7. The knee- of-the-curve analysis shows that EPA's James River allocations would impose billions of dollars of additional cost while achieving reductions of in-stream chlorophyll-a concentrations that are within the margin of error of the test method. The justification of such costs is simply not present.
8. The EPA's own calculations and charts show that the James River has a minimal affect on Bay water quality. Thus, the most rigid of the TMDLs is placed on the body of water that has the least impact on the Bay. The James River TMDLs are an example of the EPA overreaching its authority as to the Bay clean-up project.

VII. EPA DOES NOT HAVE THE AUTHORITY TO ESTABLISH A DEADLINE IN THE TMDL FOR ACHIEVING THE LOAD REDUCTIONS

The Clean Water Act and EPA's regulations do not give it the authority to establish a 2025 compliance deadline in the TMDLs. Even if such authority exists, the EPA fails to establish why 2025 was selected as a compliance date, and there is no evidence that it cannot be 2030 or 2050. The arbitrary and capricious selection of 2025 forces the City, as well as the other Hampton Roads localities and private businesses, to incur vast financial obligations at a time when they can least afford to do so.

The EPA also does not have the authority through the Clean Water Act to review or disapprove the Commonwealth's WIP. Its action is inconsistent with thousands of other TMDLs that have been established across the country.

Of all the source sectors covered by the TMDLs, none is affected more by the 2025 deadline than the urban runoff sector because much of the difficulty and cost of achieving the urban runoff load reductions is associated with retrofits independent of redevelopment. Historic redevelopment rates fall far short of those that would be needed to achieve the load reductions without forcing the City to acquire the property interests needed for the retrofits and assume responsibility for retrofit installation and maintenance. The resultant effect is particularly adverse to the City of Virginia Beach.

Further, much of this retrofitting, if not done when properties redevelop, would require significant changes to land use law in the Commonwealth of Virginia. Without legislative action and necessary regulatory change which would further reduce an already untenable deadline for compliance by the localities, no Virginia locality has the authority to require the retrofitting of private property.

VIII. CONCLUSIONS AND RECOMMENDATIONS

The Model results that are the basis for the proposed allocations are clearly lacking in the level of precision and certainty required to justify the resulting billions of dollars in costs. EPA professes to be taking an adaptive management approach to the TMDLs; but in reality, EPA is taking an adaptive legal and regulatory approach to the TMDLs by establishing the TMDLs based on incomplete and flawed science and then seeking to supply the missing documentation after the fact. The only outcome of the EPA's course of action that is reasonably certain is that localities will be forced to dig deeply into the pockets of their citizens at a time when they can least afford it; the results that EPA hopes for are, by contrast, highly speculative at best.

If EPA is truly committed to an adaptive management approach to the TMDLs, it would adopt them based upon the allocations in the Tributary Strategies and then update the TMDLs when the Phase 5.3 CBWM is fully transparent, developed and calibrated to within an acceptable margin of uncertainty. No time would be lost if EPA's accountability framework remains in place to ensure that progress toward achieving the Tributary Strategy allocations continues while work on the Phase 5.3 CBWM and model inputs are underway. In fact, the approach the City recommends likely would achieve our mutual water quality goals for the Bay more efficiently, cost-effectively, and quickly by fostering the federal, state, and local partnership that is so critical to an undertaking of this magnitude. EPA's inexplicable adherence to an artificial deadline for establishing the TMDLs and its deeply-flawed approach to date serves only to undermine that partnership and instead cause significant hardship to the City of Virginia Beach and its citizens, who will ultimately be forced to bear the burden of compliance.